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RESEARCH PAPER

Participation of the elderly after vision loss

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Abstract

Purpose. To assess the degree of participation of the visually impaired elderly and to make a comparison with population-based reference data.

Method. This cross-sectional study included visually impaired elderly persons ($\geq$55 years; $n = 173$) who were referred to a low-vision rehabilitation centre. Based on the International Classification of Functioning, Disability and Health (ICF) participation in: (1) domestic life, (2) interpersonal interactions and relationships, (3) major life areas, and (4) community, social and civic life was assessed by means of telephone interviews. In addition, we assessed perceived participation restrictions.

Results. Comparison with reference data of the elderly showed that visually impaired elderly persons participated less in heavy household activities, recreational activities and sports activities. No differences were found for the interpersonal interactions and relationships domain. Participants experienced restrictions in household activities (84%), socializing (53%), paid or voluntary work (92%), and leisure activities (88%).

Conclusions. Visually impaired elderly persons participate in society, but they participate less than their peers. They experience restrictions as a result of vision loss. These findings are relevant, since participation is an indicator for successful aging and has a positive influence on health and subjective well-being.

Keywords: *Social participation, elderly, visual impairment, quality of life, leisure activities*

Introduction

Above the age of 50 the prevalence of visual impairment increases exponentially [1]. A recent study in the Netherlands has reported prevalence rates in 2008 of 2.4% for blindness (visual acuity < 0.05) and 7.8% for low vision ($0.05 \leq$ visual acuity < 0.3) in the elderly aged 65 and over [2]. The majority (79%) of the total number of visually impaired people (visual acuity < 0.3) is 65 years or older [2]. Due to the aging of the population the number of visually impaired elderly persons will strongly increase over the decades to come [1,3]. In the Netherlands, it is estimated that between 2005 and 2020 the number of visually impaired elderly persons will increase by 18.7% [1]. Visually impaired elderly persons will be doubly burdened; next to the general consequences of aging, they will experience additional restrictions due to the visual impairment [4], which is a potential threat to maintaining independence in daily life.

In general, activity and time-spending patterns change when people grow older [5–8]. Older individuals have more difficulty performing daily activities and perceive more participation restrictions in daily life such as mobility outside the home and interpersonal interactions [9]. From age 75, participation decreases strongly [10]. In addition to the effect of aging, vision loss may not only lead to difficulties in performing activities [11–17] but also to loss of activities [18,19], dependency [20–22] and social isolation [23]. Vision loss is related to depression [24–27] and emotional distress [28] and has a negative impact on health-related quality of life [15,28–33]. Besides, it is regarded an important factor of disability [23].

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According to the International Classification of Functioning, Disability and Health (ICF) [34] of the World Health Organization (WHO), an individual's functioning or disability is a dynamic interaction between health conditions and contextual factors (i.e. environmental and personal factors). With the ICF, the WHO underlines the importance of participation – defined as 'involvement in life situations' – as an outcome measure of health condition. Previous research among the visually impaired elderly mostly focused on limitations in executing activities, such as reading, community, mobility and self-care [11–16,35–38]. A recent study on participation restrictions of visually impaired elderly persons showed that they experienced more problems compared to the elderly without visual impairment [39]. To the best of our knowledge, self-reported performance of participation of visually impaired elderly persons has not been extensively investigated. In accordance with the policy of the WHO, as described in the ICF, our study focuses on participation in society of the visually impaired elderly.

The present study aims to describe the degree of participation of visually impaired elderly persons and to make a comparison with population-based reference data of the elderly. In addition, we examine differences in participation between relatively younger and older participants, and between those with relatively better and those with poor vision. Based on the literature, we expect that the visually impaired elderly participate less than the elderly in the reference population. Likewise, we expect that older participants participate less than younger participants, and that participants with poor vision participate less than participants with better vision. Besides self-reported performance of participation, this study also assesses perceived participation restrictions. We expect that older participants and participants with poor vision perceive more restrictions.

Methods

Study population

An age-stratified sample of 350 visually impaired elderly persons was drawn out of all 786 newly registered visually impaired elderly persons ($\geq$55 years) at Royal Dutch Visio (region North Netherlands), a low-vision rehabilitation provider, between 1 July 2006 and 30 June 2007. Stratification was applied (i.e. $<$75 years vs. $\geq$75 years) because of expected differences in participation between these age groups. Inclusion criteria were: (1) aged $\geq$55 years; (2) able to speak Dutch; (3) able to understand instructions concerning response sets; and (4) referred to a low-vision rehabilitation centre according to the 'Guidelines on the referral of visually impaired persons to low-vision services' [40]. According to these evidence-based guidelines of the Dutch Society of Ophthalmology, persons with a visual acuity $\leq$0.3 and/or visual field $\leq 30^{\circ}$ in the better eye should be referred for rehabilitation to a low-vision rehabilitation centre. In addition, persons with a visual acuity $\leq$0.5 who experience problems with reading or other daily life activities due to visual impairment and who have a well-defined request for help should be referred to a low-vision rehabilitation centre as well. Out of the sample, 264 persons were eligible for participation in the study and 173 persons agreed to participate (response 66%). Figure 1 shows a flow diagram of inclusion of study participants.

Non-response analysis showed that study participants (mean age 72.3 years; SD 9.7) were younger than non-responders (mean age 78.5 years; SD 9.7; $t = -4.976$, $p < 0.001$). No difference was found with respect to gender.

Design and procedure

Data for this cross-sectional study were collected by means of telephone interviews performed by experienced interviewers who received an additional training. We performed seven pilot interviews to test the interview schedule, which resulted in a minor revision of the interview schedule. Prior to the telephone interview participants gave informed consent. The study design was reviewed by the Medical Ethics Review Committee of the University Medical Center Groningen. The study followed the tenets of the Declaration of Helsinki.

Measures

Self-reported performance of participation. In accordance with the ICF, participation was defined as 'involvement in life situations' [34]. The ICF lists nine chapters that cover the full range of 'Activities and Participation' [34] and gives several options for differentiating 'Participation' from 'Activities'. We adopted the method of Post et al. [41] that applied one of these options, and designated four chapters that represent participation: (1) domestic life (ICF-chapter 6); (2) interpersonal interactions and relationships (ICF-chapter 7); (3) major life areas (ICF-chapter 8); and (4) community, social and civic life (ICF-chapter 9).

To enable the comparison in degree of participation between visually impaired elderly persons and population-based reference data, we measured participation in a similar method as the population surveys that generated these reference data [42–44].

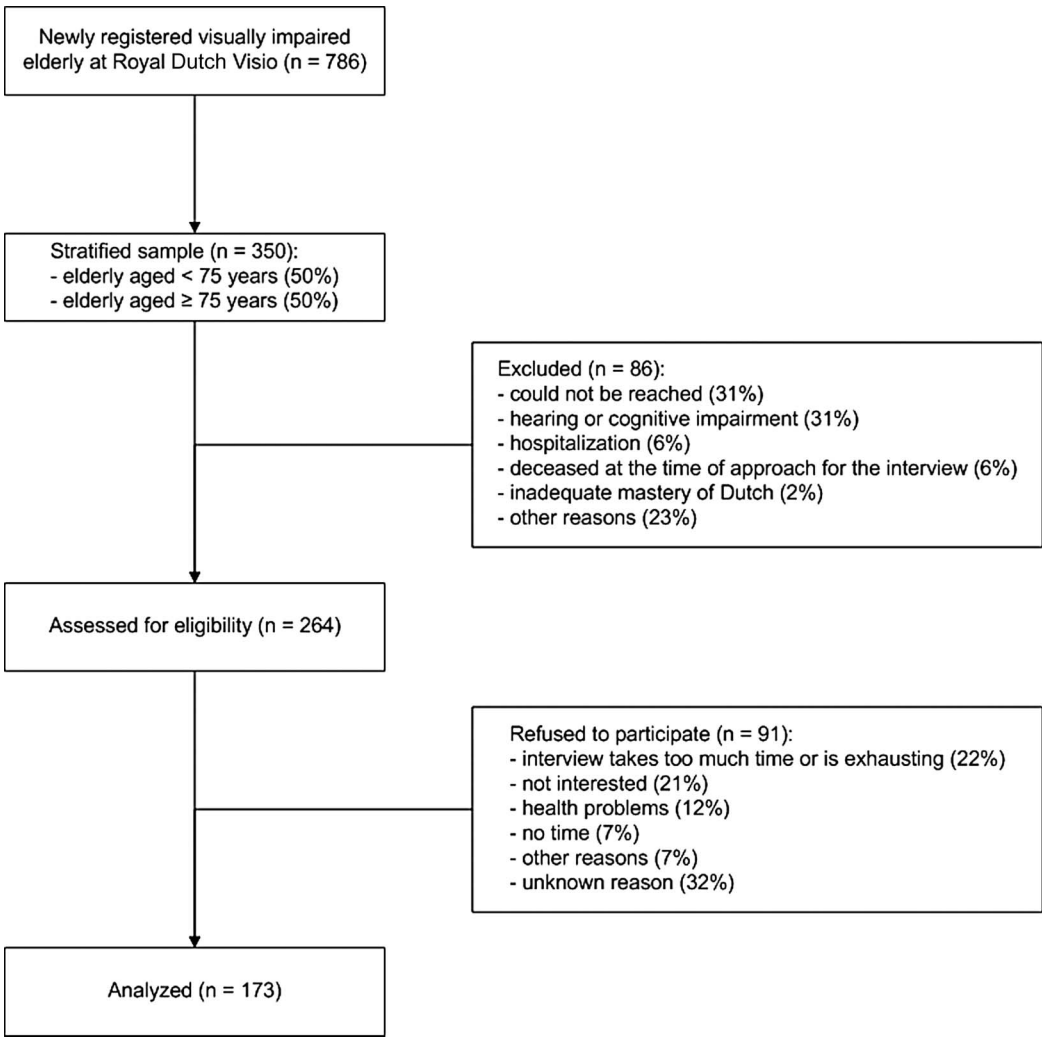

Figure 1. Flow diagram of inclusion of the study participants.

For this purpose, each of the four ICF-chapters was linked to suitable survey items, which subsequently were included in the interview schedule. Two items that were not listed in the surveys (i.e. going shopping and hobby activities) were additionally included, because of their relevance to the population under study.

Participation in *domestic life* (ICF-chapter 6) comprised light household activities (e.g. doing the dishes, dusting, ironing, and cooking), heavy household activities (e.g. window cleaning, vacuuming, and mopping), assisting others (i.e. informal assistance of others outside the respondent's own home), and shopping (alone or with someone else). Performance of these activities was assessed as a dichotomous variable (yes/no). *Interpersonal interactions and relationships* (ICF-chapter 7) were operationalised as socializing, defined as meeting relatives, friends, or neighbours in person, including contact by telephone or e-mail. Elderly persons who socialized once a week or more were classified as frequently participating (yes/no). *Major life areas* (ICF-chapter 8) comprised paid work and voluntary work. Because in the Netherlands official retirement starts at the age of 65, participation in employment and weekly working hours were only assessed in participants aged <65 years. Employment (yes/no) was defined as participation in paid work irrespective of the number of hours spent per week. Voluntary work (yes/no) was defined as unpaid work in organized associations. The *community, social and civic life* (ICF-chapter 9) domain comprised involvement in clubs or associations (yes/no), in hobby activities (yes if $\geq$1x/week); going out to recreational places for entertainment (e.g. nature reserve, forest, public garden, recreation area; yes if $\geq$1x/month), cultural places (e.g. theatre, cinema, museum; yes if $\geq$1x/month) and public places (e.g. café or restaurant; yes if $\geq$1x/month); going on holidays (yes if $\geq$1x/year); involvement in sports activities (yes/no); and in religious activities (yes if $\geq$1x/month).

Perceived participation restrictions. Perceived restrictions in participation were assessed by four questions

constructed by the authors. Participants rated to what extent their participation in household activities (ICF-chapter 6), socializing (ICF-chapter 7), paid or voluntary work (ICF-chapter 8), and leisure activities (ICF-chapter 9) is restricted due to the visual impairment. The response set consisted of a 4-point scale: not at all, a little, quite a bit, very much. Participants with score 1 (not at all) were classified as experiencing no participation restrictions, whereas participants with score 2 through 4 were classified as experiencing restrictions.

Vision-related characteristics. (*a*) *Degree of visual impairment* was indicated by corrected binocular visual acuity at distance (VODS). Data with respect to visual acuity and vision impairment were collected from medical files available at the low-vision rehabilitation centres of Royal Dutch Visio, such as the referral form of the treating ophthalmologist of the hospital. If this referral form was unavailable, the most recent report of the optometrist of Royal Dutch Visio was used. (*b*) *Duration of vision loss* was computed by subtracting self-reported age of onset of vision loss from participants' age. (*c*) *Self-perceived vision* was measured with the single-item subscale 'general vision' of the Visual Functioning Questionnaire (VFQ-25) [45]. Participants were asked: 'At the present time, would you say your eyesight using both eyes (with glasses or contact lenses) is excellent, good, fair, poor, very poor or are you completely blind?' Participants with response categories excellent through fair were classified as having relatively 'better vision', whereas participants with responses poor through completely blind were classified as having 'poor vision'. Stratification of vision was based on self-perceived vision (VFQ-25) because of the heterogeneity of visual impairment in the study group. According to the Dutch guidelines [40] not only persons with loss of visual acuity were referred to Royal Dutch Visio, but persons with a visual field defect and persons who experienced problems with reading or other daily life activities were referred as well and subsequently included in our study.

Demographic characteristics and co-morbidity. The following demographic characteristics were assessed: age, gender, and living arrangement (living alone vs. co-residing). Co-morbidity was measured by means of an open-ended question that asked participants to list all chronic conditions they were suffering from other than their eye disease. The number of chronic conditions was used as a co-morbidity variable.

Statistical analysis

Non-response analysis was performed with Student's *t* test and Chi-square test. Data on participation of study participants were compared with reference data from Statistics Netherlands [10] and the Longitudinal Ageing Study Amsterdam (LASA) [46]. Because Statistics Netherlands presents data stratified for three age groups, we stratified for age in the same way: (1) 55–64 years; (2) 65–74 years; and (3) $\geq$75 years. Differences in participation were tested with Chi-square tests.

To analyze differences in participation related to age and vision, we accordingly stratified the study group for age ($<$75 years [$n = 103$] vs. $\geq$75 years [$n = 70$]) and vision ('poor vision' [$n = 118$] vs. 'better vision' [$n = 48$]). Differences between these subgroups were tested with Chi-square tests. Fisher's exact test (one-sided) was used when expected frequencies in crosstab tabulation were less than 5.

Due to multiple comparisons, which give a higher probability of finding a statistical significant difference just by chance, a stricter cut-off for statistical significance was applied ($p < 0.01$). In accordance with our formulated expectations one-sided tests were used. All analyses were performed with the statistical software package SPSS, version 14.0 (SPSS, Inc., Chicago).

Results

Study population

Table I shows the demographic and vision-related characteristics of the study group. Participants' ages ranged from 55 to 93 years (mean age 72 years). Sixty percent were aged $<$75 years. Median time since onset of vision loss was 7 years (range 0–75 years). Seventy-one percent of the participants had poor vision and 29% had better vision. The median binocular visual acuity was 0.25. The binocular visual acuity ranged from 0.001 to 1.25 (20/20000–20/16). Five percent of the participants were blind (VODS <0.05). Age-related maculopathy was the most common primary cause of the visual impairment (49%). More than half of the participants (55%) had one or more chronic conditions other than their eye disease (range 0–5; median = 1). Diseases of the circulatory system (18%) and diabetes mellitus (12%) were the most prevalent chronic conditions participants were suffering from.

Self-reported performance of participation

The majority of the participants in the study group performed light household activities, went shopping, and was involved in socializing with family members, friends and neighbours (Table II). Of the participants of working age ($<$65 years) 33% had a paid job

Table I. Demographic and vision-related characteristics, and co-morbidity of the study group ($n = 173$).

Characteristic	Value, *n* (%)
Age (years)	
55–64	40 (23)
65–74	63 (36)
75–84	51 (30)
≥85	19 (11)
Mean ± SD	72.3 ± 9.7
Sex	
Male	73 (42)
Female	100 (58)
Living arrangement	
Alone	77 (45)
Co-residing	96 (55)
Duration of vision loss (years)	
Median	7
Self-reported general vision (VFQ-25)	
Poor vision	118 (71)
Better vision	48 (29)
Binocular visual acuity at distance (VODS)	
Median	0.25
Primary cause of visual impairment	
Age-related maculopathy	81 (49)
Vascular disorders*	12 (7)
Optic nerve disorders	10 (6)
Congenital and hereditary disorders†	7 (4)
Corneal disorders	5 (3)
Glaucoma	4 (2)
Cataract	4 (2)
Other primary causes	12 (7)
Combination of causes	22 (13)
Cause unknown	10 (6)
Co-morbidity	
0	74 (45)
1	56 (34)
≥2	35 (21)
Type of co-morbid diseases	
Diseases of the circulatory system	29 (18)
Diseases of the respiratory system	11 (7)
Diseases of the nervous system	9 (5)
Diseases of the vestibular system	8 (5)
Diabetes mellitus	19 (12)
Osteoarthritis	11 (7)
Rheumatoid arthritis	8 (5)
Other chronic conditions	45 (27)

Percentages are based on totals for each category, and may not total 100 because of rounding.
*e.g. diabetic retinopathy.
†e.g. retinitis pigmentosa.

(mean 31.1 hrs/week; SD 12.0; range 5–48). Work disability due to vision loss was cited by 63% of the unemployed as the main reason for not being employed. With respect to participation in the community, social and civic life, the majority of participants (77%) were involved in hobby activities, whereas a minority of the participants reported going out to recreational (23%), public (16%) and cultural places (4%).

Table II. Self-reported performance of participation of visually impaired elderly persons ($n = 173$).

Domain of participation	Value, *n* (%)
Domestic life	
Light household activities	155 (90)
Heavy household activities	74 (43)
Assisting others	70 (40)
Go shopping	148 (86)
Interpersonal interactions and relationships	
Socializing with relatives*	152 (88)
Socializing with friends*	131 (76)
Socializing with neighbours*	120 (69)
Major life areas	
Employment ($n = 40$, < 65 years)	13 (33)
Voluntary work	47 (27)
Community, social and civic life	
Involvement in clubs/associations	87 (50)
Hobby activities*	133 (77)
Recreational places†	39 (23)
Cultural places†	7 (4)
Public places†	28 (16)
Holidays‡	99 (57)
Sports activities	70 (40)
Walking	22 (31)
Cycling	11 (16)
Gymnastics	10 (14)
Swimming	5 (7)
Other	22 (31)
Religious activities†	54 (31)

*≥1x/week.
†≥1x/month.
‡≥1x/year.

Comparison with population-based reference data

Comparison with population-based reference data (Table III) showed that visually impaired elderly persons in all age groups participated less in heavy household activities ($p < 0.001$ for all age groups). In addition, visually impaired participants aged 55–64 years and aged 65–74 years went less often to recreational places ($p < 0.001$ for both age groups) and participated less in sports activities ($p = 0.004$ and $p < 0.001$, respectively) compared with their peers. However, visually impaired participants aged ≥75 years were more involved in assisting others ($p < 0.001$) compared with their peers. No differences were found for the domain of interpersonal interactions and relationships, and the domain of major life areas.

Differences in participation between subgroups

Differences in participation between younger and older participants, and differences between participants with better vision and participants with poor vision were examined by stratifying for age

Table III. Comparison of self-reported performance of participation of visually impaired elderly persons with a reference population of elderly, stratified for age.

	Age 55–64 years			Age 65–74 years			Age ≥75 years		
	Study group	Reference population		Study group	Reference population		Study group	Reference population	
Domain of participation	$n=40$	$n=1113$	p	$n=63$	$n=713$	p	$n=70$	$n=575$	p
Domestic life									
Light household activities	97	93*	0.14	91	95*	0.06	84	93*	0.01
Heavy household activities	63	90*	<0.001	52	84*	<0.001	23	55*	<0.001
Assisting others	50	33	0.01	41	34	0.12	34	18	<0.001
Interpersonal interactions and relationships									
Socializing with relatives†	83	87	0.20	89	86	0.26	90	88	0.31
Socializing with friends†	83	73	0.09	73	73	0.50	74	70	0.23
Socializing with neighbours†	68	75	0.14	68	80	0.02	71	70	0.41
Major life areas									
Employment	33	47	0.04	–‡	–‡	–‡	–‡	–‡	–‡
Voluntary work	33	41	0.14	33	46	0.03	19	26	0.09
Community, social and civic life									
Involvement in clubs/associations	45	41	0.31	57	46	0.04	47	36	0.03
Recreational places§	18	59	<0.001	24	54	<0.001	24	34	0.05
Public places§	25	32	0.18	13	26	0.01	14	18	0.22
Holidays¶	73	77	0.25	60	65	0.23	46	41	0.23
Sports activities	50	71*	0.004	35	69*	<0.001	40	51*	0.05
Religious activities§	20	20	0.50	37	33	0.28	33	34	0.42

Data are given as percentage of participants; reference data are extracted from Statistics Netherlands [10] unless otherwise indicated.
*Reference data extracted from LASA [46]: age 55–64 years ($n=374$); age 65–74 years ($n=379$); age ≥75 years ($n=234$).
†≥1x/week.
‡Because 65 is the age at which official retirement starts in the Netherlands, no data are available for these age groups.
§≥1x/month.
¶≥1x/year.

and self-reported general vision (VFQ-25), as presented in Table IV. Results indicate that younger participants (<75 years) were more engaged in heavy household activities ($p < 0.001$) and hobby activities ($p = 0.002$), and had more holidays ($p = 0.006$) compared to older participants (≥75 years). No differences in degree of self-reported performance of participation were found between participants with poor vision and participants with relatively better vision.

Perceived participation restrictions

Table V presents data on perceived participation restrictions due to visual impairment. The percentage of participants reporting participation restrictions ranged from 53% in socializing to 92% in doing paid or voluntary work. Only 6% of the visually impaired elderly persons indicated not being restricted in any domain of participation. Examination of differences in perceived restrictions between subgroups showed that the prevalence of participation restrictions was highest in the poor vision subgroup. Participants with poor vision perceived more restrictions in household activities ($p < 0.001$) and socializing ($p = 0.002$) compared to those with relatively better vision. We found no differences in perceived restrictions with respect to age (<75 years vs. ≥75 years).

Discussion

The objective of this study has been to describe the degree of self-reported performance of participation of visually impaired elderly persons (≥55 years) and to compare this with the degree of participation of a reference population. Results indicate that visually impaired elderly persons do participate in society, i.e. are involved in life situations as defined by the ICF. The majority of our study population was engaged in household activities, in shopping, in socializing with family, friends and neighbours, in hobby activities, and in activities of clubs or associations. Only a minority was engaged in going out to recreational, cultural and public places. Comparison with peers, however, showed that visually impaired elderly persons participated less in household activities and sports activities, and went less often to recreational places, which was in line with our expectations. In contrast, no differences were found for the 'interpersonal interactions and relationships' domain of participation. Besides self-reported performance of

Table IV. Differences in self-reported performance of participation between subgroups, stratified for age and self-reported general vision ($n = 173$).

Domain of participation	Age <75 years $n = 103$	Age ≥75 years $n = 70$	p value	Better vision $n = 48$	Poor vision $n = 118$	p value
Domestic life						
Light household activities	93	84	0.03	90	90	0.58*
Heavy household activities	56	23	<0.001	50	42	0.16
Assisting others	45	34	0.09	44	39	0.29
Go shopping	88	81	0.10	88	86	0.37
Interpersonal interactions and relationships						
Socializing with relatives†	86	90	0.23	85	89	0.26
Socializing with friends†	77	74	0.36	75	76	0.43
Socializing with neighbours†	68	71	0.31	79	64	0.03
Major life areas						
Employment	–‡	–‡	–‡	42§	29§	0.33*
Voluntary work	33	19	0.02	33	25	0.15
Community, social and civic life						
Involvement in clubs/associations	52	47	0.25	54	47	0.19
Hobby activities†	85	66	0.002	88	74	0.03
Recreational places¶	21	24	0.33	23	23	0.50
Cultural places¶	4	4	0.59*	8	3	0.11*
Public places¶	18	14	0.29	21	15	0.19
Holidays**	65	46	0.006	59	58	0.47
Sports activities	41	40	0.46	50	37	0.07
Religious activities¶	30	33	0.35	35	28	0.17

Data are given as percentage of participants
*Fisher's exact test.
†≥1x/week.
‡Because 65 is the age at which official retirement starts in the Netherlands, the difference in employment between the two age groups was not tested.
§This item only applied to participants aged < 65 years ($n = 40$); better vision ($n = 12$); poor vision ($n = 28$).
¶≥1x/month.
**≥1x/year.

Table V. Perceived participation restrictions and differences in participation restrictions between subgroups, stratified for age and self-reported general vision ($n = 173$).

Domain of participation	Study group $n = 173$	Age <75 years $n = 103$	Age ≥75 years $n = 70$	p value	Better vision $n = 48$	Poor vision $n = 118$	p value
Household activities	84	84	83	0.43	65	92	<0.001
Socializing	53	52	54	0.41	35	60	0.002
Paid or voluntary work†	92	95	84	0.26*	94	91	0.56*
Leisure activities	86	84	89	0.18	79	89	0.05

Data are given as percentage of participants
*Fisher's exact test.
†This item only applied to participants having paid work and/or voluntary work ($n = 51$).

participation, we assessed participation restrictions and found that 94% of the visually impaired elderly experienced restrictions in one or more domains of participation.

Studies with respect to self-reported performance of participation among the visually impaired elderly are scarce. To our knowledge only Crews and Campbell [13] assessed participation of American visually impaired elderly persons (≥70 years). With respect to socializing, Crews and Campbell's study found that 74% of the participants visited relatives in the past two weeks, 86% phoned relatives, 67% visited friends and 80% phoned friends [13]. These findings are in line with findings of our study. In contrast, the study of Crews and Campbell reported a higher percentage (56%) of visually impaired elderly persons eating out in a restaurant in the past two weeks [13]. Only 16% of our Dutch study group reported going out to public places (including restaurants) once a month or more. This may be explained by a cultural difference; the general population of the elderly in the United States

have more of a habit of eating out in a restaurant than the elderly in the Netherlands (66% [13] vs. 22% [10]).

Our study found no differences in the ICF-domain 'interpersonal interactions and relationships' between visually impaired elderly persons and the elderly in the reference population. Socializing, defined as meeting others in person including contact by telephone or e-mail, does not necessarily require elderly persons to go outdoors. Crews and Campbell [13] reported that visually impaired elderly persons were more often engaged in phoning friends (80%) and relatives (86%) than in visiting friends (67%) and relatives (74%). Outdoor mobility restrictions, prevalent in visually impaired elderly persons [47], may be of less influence on this particular domain of participation. However, Boerner et al. [48] showed that 35% of adults with vision impairment perceive a decrease in the frequency of socializing after vision loss and that 47% of visually impaired adults reported being more dependent on others. Wang and Boerner [49] showed that the ways in which visually impaired individuals relate to others changed after vision loss. Visually impaired persons face two major challenges in relating to other people. The first is named 'difficulty in social situations due to a lack of understanding from others'; the second challenge is 'difficulty in social situations due to a lack of visual cues for information' [49]. These challenges indicate re-establishment of ways of communication with other people which was present in 26% of adults with vision impairment [48]. Although we may conclude that there is no difference in the frequency of socializing between the visually impaired elderly and the reference population, Boerner et al. [48] and Wang and Boerner [49] showed that the visually impaired elderly do experience difficulties in socializing.

Besides self-reported performance of participation our study assessed perceived participation restrictions and found high prevalence rates for restrictions in household activities, doing paid or voluntary work and leisure activities. These findings are in line with Lamoureux et al. [11,47] who reported restrictions of visually impaired elderly persons in leisure activities, employment and shopping. Desrosiers et al. [39] showed that compared to the normally sighted elderly, the visually impaired elderly experience more restrictions in participation in daily activities and social roles. The least restricted domain of participation in our study group was socializing, which corresponds to findings of Lamoureux et al. [11] who report that 44% experienced no restrictions in visiting friends and family due to vision loss, as measured with an item of the consumer and social interactions domain of the Impact of Vision Impairment Questionnaire [50]. Although the visually impaired elderly experience difficulties in socializing [11,48,49], the prevalence of participation restrictions in the domain of interpersonal relationships does not differ from the normally sighted elderly as was shown by Desrosiers et al. [39].

Subgroup analysis showed that the relatively younger study participants (<75 years) participated more in some domains of participation (i.e. heavy household activities, hobby activities, holidays) which is in accordance with our expectations. Those relatively younger study participants, however, experienced the same level of participation restrictions as the older study participants (≥ 75 years), which was not expected. Although the visually impaired elderly participate less in some domains of participation compared to peers, comparison within the study group showed no differences in self-reported performance of participation between elderly with a poor versus better vision, which contradicts our formulated hypothesis. Apparently, merely having a visual impairment is associated with lower levels of participation, while severity of the visual impairment does not play an additional role. The prevalence of participation restrictions, however, was highest among those with a poor vision, which is in line with findings of Hassell et al. [16], Lamoureux et al. [11,47], and Weih et al. [50]. This finding indicates the negative association between self-reported vision and perceived participation restrictions.

Results of the present study should not be interpreted without taking some limitations into account. The inclusion of study participants through a low-vision rehabilitation centre may implicate selection of a subgroup of the visually impaired elderly. The fact that non-responders were older, may have resulted in an overestimation of participation, because younger study participants had higher levels of participation. In addition, it may be that non-responders were less likely to participate in the study, because they in general are less active. Study participants therefore may have been a select group of relatively active visually impaired elderly persons. Furthermore, data on participation were collected by means of subsets of items extracted from available population surveys, which in itself is not equivalent to a validated questionnaire. At the time of the data collection we concluded – based on a review of Perenboom and Chorus [51] and our own literature search – that no participation questionnaire was available that both met our requirements of assessing participation from a comprehensive view, and facilitated comparison with reference populations as well. Data on participation are self-report data derived through telephone interviews which may imply social desirability bias. Lastly, besides age and general vision, other factors prevalent in the visually impaired elderly (i.e. co-morbidity [14,52,53] and depression [24–27,52]) that may explain differences in participation between the study group and the reference populations could not be examined. Due

to unavailability of this information in the reference data sets, it was not possible to test for potential confounding effects.

In conclusion, this study assessed self-reported performance of participation of visually impaired elderly persons from a comprehensive view, based on the ICF-framework of the WHO [34]. We highlighted that visually impaired elderly persons do participate in society, but that in some specific domains they participate less than their peers. In addition, participation restrictions are prevalent in the visually impaired elderly. This is an important finding since participation in society can be considered as an indicator of successful aging [54] and has a positive influence on physical and mental health [55], quality of life [56] and subjective well-being [54]. Decreased participation and activity loss are associated with an increased risk of functional [57] and cognitive decline in the elderly [58,59]. In addition, those who participate less are at risk with regard to social isolation and may experience feelings of loneliness [60].

Visually impaired elderly persons are doubly burdened. Besides the general consequences of aging, they experience additional participation restrictions due to vision loss. The number of elderly people with a visual impairment will increase in the next decades, extending the demand for specialized vision related advice, care and rehabilitation [1]. To guide rehabilitation services, future research is needed to examine which factors (e.g. physical fitness, self-management abilities, self-esteem, social support) determine participation restrictions of the visually impaired elderly.

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